12–15 equidistant tomographic slices. A quantitative algorithm derived the volume of each slice from its area and thickness, computed slice M and yielded total LV M. Following euthanasia, the LV in the autopsied heart was isolated, trimmed and weighed by an independent observer. M determined by in vivo 3DE was compared to the actual anatomic M. *Results:* Using the rotational approach, we were able to derive dynamic 3DE reconstructions of the LV in all dogs. Actual LV M in grams was (mean ± SD) 79.9 ± 10 (range: 63.1 to 101) and the 3DE LV M 79.1 ± 10 (range: 65.4 to 102.3) (p = NS). The correlation between 3DE M (y) and actual M (x) was: $y = 0.91x + 6.5$, $r = 0.96$, $p < 0.0001$. Mean difference between measurements (Bland-Altman analysis) was negligible (only 0.75 grams). *Conclusion:* Volume-rendered 3DE, in addition to providing multiple dynamic 3D projections of the LV, allows accurate determination of LV mass in the beating heart, without requiring geometric assumptions.

967-94 Use of a New Semi-Automated Method to Determine Regional Left Ventricular Wall Thickening From Intracardiac Ultrasound Images

Charles R. McKay, Xiangmin Zhang, Weidong Liang, Steven DeJong, Kirk Spencer, Richard E. Kerber, Milan Sonka. *University of Iowa, Iowa City, IA*

We have reported the use of low dose dobutamine and intracardiac (ICUS) imaging to assess regional myocardial viability. Although ICUS imaging can overcome technical limitations of transthoracic or transesophageal imaging in the cardiac catheterization laboratory, its use has been limited, in part due to the need for manual analysis to determine regional left ventricular (LV) function We have recently developed a semiautomatic method which can accurately detect endocardial and epicardial borders in ICUS images. A fully automated graph search based border detection algorithm identifies optimal endocardial and epicardial borders in a user-defined region of interest which encloses the LV epicardium and septum. In this study we applied this method to determine changes in regional LV wall thickening. We compared 28 canine LV images, analyzed by blinded manual and computer methods. Images were obtained at rest, during acute coronary occlusion and release, and during dobutamine infusion. Regional wall thickening determined by a blinded experienced observer was compared to wall thickening determined by computer without observer modifications. Results:

	Slope =	Intercept =	r =	95% CL for slope
Diastolic thickness	0.92	0.132 mm	0.84	0.89–0.96
Systolic thickness	0.88	0.184 mm	0.82	0.84–0.92

Thus, automated border detection accurately reflected changes in regional thickening in ischemic inotropic conditions. ICUS images were difficult to analyze in the regions of the guidewire artifact. We conclude that this new method is promising and warrants further clinical validation.

967-95 Automatic Border Detection of Intravascular Ultrasound Images

Stephen P. Wiet, Stuart A. Greenfield, Reena Sinha, Gorav Ailawadi, Michael J. Vonesh, Bonnie J. Kane, Farooq A. Chaudhry, Krishnan B. Chandran, David D. McPherson, Edwin L. Dove. *Northwestern University Medical School, Chicago, IL; University of Iowa, Iowa City, IA*

For rapid assessment of vascular morphology, we have developed and modified two algorithm(s) [ALG(s)] for intravascular ultrasound (IVUS) border detection. To automatically detect IVUS intimal borders, we use a Fuzzy Hough Transform for objects whose shape cannot be predetermined. To detect adventitial boundaries we perform an ALG that uses a radial gradient method with Fast Fourier transform of low pass filtered data. Both ALGs compute image contours within 5 seconds. To assess ALG accuracy, 33 IVUS images of varying quality and plaque morphology were evaluated. Automatically determined luminal areas (LA) and adventitial areas (AA) were compared to manual LA and AA for each image.

Results:

	Δ	r	n	
LA	0 ± 2.1*	0.88	33	Auto LA = 0.9 ManLA ± 1.3
AA	4 ± 5.5*	0.87	33	Auto AA = 0.8 ManAA ± 8.5

$\bar{X} \pm SD$ mm²; Δ = mean difference, Manual vs. Automatic; *p = NS

Inter and intra-observor manual tracing variability was low. Luminal and adventitial areas were accurately predicted by the ALGs despite variable image quality and plaque morphology. These novel ALGs provide rapid (near real time) on-line border definition at IVUS imaging allowing quantification and may facilitate intervention.

968 Ventricular Function: Clinical Applications

Tuesday, March 26, 1996, Noon–2:00 p.m.
Orange County Convention Center, Hall E
Presentation Hour: 1:00 p.m.–2:00 p.m.

968-15 Day to Day Reproducibility of Mental Stress Induced Left Ventricular Dysfunction

Diwakar Jain, Matthew Burg, Robert Soufer, Teresa Cozza, Barry L. Zaret. *Yale University, New Haven CT*

Mental Stress (MS) results in LV dysfunction (Dys) in patients (pts) with coronary artery disease (CAD). However, the day to day reproducibility of MS induced LV Dys is not known. Twenty pts with CAD and exercise induced ischemia underwent a battery of MS tests [Mental Arithmetic (MA), Anger Recall (AR) and Color Stoop test (CS)] while undergoing continuous ambulatory LV function monitoring. Ten pts developed LV Dys (≥ 5% fall in LV ejection fraction) with ≥ 1 stressor(s). These 10 pts underwent second MS 4–8 weeks later with no change in medication or clinical status. The frequency of LV Dys on the first (#1) and second occasion (#2), reproducibility of the responses and increase in HR (ΔHR) and systolic blood pressure (ΔSBP) were:

	MA	AR	CS	≥ 1 test	ΔHR	ΔSBP
LV Dys. #1	70%	90%	62%	100%	7 ± 5	27 ± 10
LV Dys #2	60%	80%	75%	90%	7 ± 4	24 ± 10
Reproducibility	50%	90%	62%	90%		

In CAD pts with MS induced LV Dys, AR produces LV Dys with highest frequency (90%) and is most reproducible (90%) 4–8 weeks later. In contrast, MA and CS induce LV Dys less frequently and are less reproducible. Overall, on retesting 90% of the pts who had LV Dys developed LV Dys again with at least 1 stressor. HR and SBP changes were not different between two studies. Response to repeat MA and CS may be influenced by conditioning. In contrast, response to AR remains highly reproducible since it uses a different kind of life situation to elicit anger.

These are the first reproducibility data of MS induced LV Dys over long intervals and indicate that protocols evaluating treatment effects should employ either AR alone or a battery of MS.

968-16 Evaluation of Heart Transplant Rejection and Ventricular Function With Technetium-99m Antimyosin Imaging

Terrence D. Ruddy, Stuart J. Smith, Mary M. Dalipaj, Vijay S. Chauhan, May T. Aung, Barbara A. Aubrey, Ross A. Davies, Neil G. Hartman, John P. Veinot, Rob S.B. Beanlands. *University of Ottawa Heart Institute, Ottawa, Ontario, Canada*

In 111 antimyosin imaging detects myocardial necrosis as a marker of heart transplant rejection. A new technetium-99m labelled antimyosin antibody permits larger doses of radiotracer and blood pool imaging.

We evaluated the potential of technetium-99m labeled antimyosin imaging for evaluation of rejection and ventricular function. Fifteen heart transplant patients received technetium-99m antimyosin (921.7 ± 101.3 MBq), gated blood pool imaging 5 minutes later and planar static imaging 24 hours later. Cardiac biopsy and conventional gated blood pool imaging with technetium-99m labeled red blood cells were carried out within 3 days of antimyosin imaging. Using a heart/lung ratio ≥ 1.6 as a positive scan and a biopsy score ≥ 2 (Texas Heart Institute classification), sensitivity was 100% and specificity 75% with a negative predictive value of 100% and positive predictive value of 78%. Ejection fraction and end-diastolic volume measured by antimyosin blood pool imaging and red blood cell blood pool imaging were highly correlated ($r = 0.96$) with a small mean coefficient of variation (< 5%).

Technetium-99m antimyosin imaging permits evaluation of transplant rejection with high sensitivity and accurate measurement of ventricular function.

968-17 Ventricular Dilation and Remodeling After Anterior Q-Wave Infarction: Effects of Delayed Reperfusion in the Infarcted Area

Claudio Marcassa, Michele Galli, Roberto Bolli, Pier L. Temporelli, Pantaleo Giannuzzi. *S. Maugeri Foundation Veruno, Italy; University of Louisville, KY*

LV dilation after MI is associated with further progressive enlargement over time. We have documented that recovery of perfusion and contraction in the infarct zone may continue up to 7 months after MI, a fact that could limit LV remodeling. To determine whether this delayed reperfusion (Rep) in the infarct zone attenuate the remodeling response in dilated LV, we serially evaluated 85 pts at 5 weeks and 7 months after Q-wave anterior MI.

TUESDAY POSTER